May 2001
Revised November 2005

NC7NZ14
TinyLogic® UHS Inverter with Schmitt Trigger Input

General Description

The NC7NZ14 is a triple Inverter with Schmitt Trigger input from Fairchild's Ultra High Speed Series of TinyLogic®. The device is fabricated with advanced CMOS technology to achieve ultra high speed with high output drive while maintaining low static power dissipation over a very broad V_{CC} operating range. The device is specified to operate over the 1.65V to 5.5V V_{CC} range. The input and output are high impedance when V_{CC} is 0V. Inputs tolerate voltages up to 7V independent of V_{CC} operating voltage.

Features

- Space saving US8 surface mount package
- MicroPak™ Pb-Free leadless package
- Ultra High Speed; t_{PD} 3.7 ns Typ into 50 pF at 5V V_{CC}
- High Output Drive; ±24 mA at 3V V_{CC}
- Broad V_{CC} Operating Range; 1.65V to 5.5V
- Power down high impedance inputs/output
- Overvoltage Tolerant inputs facilitate 5V to 3V translation
- Proprietary noise/EMI reduction circuitry implemented

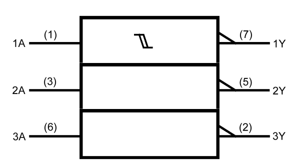
Ordering Code:

Order Number	Package Number	Product Code Top Mark	Package Description	Supplied As
NC7NZ14K8X	MAB08A	NZ14	8-Lead US8, JEDEC MO-187, Variation CA 3.1mm Wide	3k Units on Tape and Reel
NC7NZ14L8X	MAC08A	P6	Pb-Free 8-Lead MicroPak, 1.6 mm Wide	5k Units on Tape and Reel

Pb-Free package per JEDEC J-STD-020B.

Logic Symbol

IEEE/IEC



Pin Descriptions

Pin Names	Description
A	Input
Y	Output

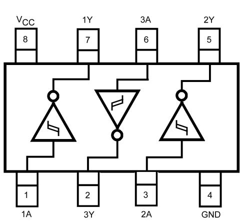
Function Table

$Y = \overline{A}$

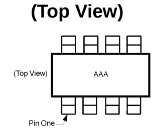
Input	Output
A	**Y**
L	H
H	L

H = HIGH Logic Level L = LOW Logic Level

Connection Diagrams

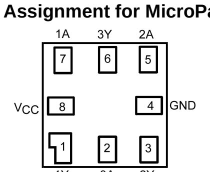


(Top View)



AAA represents Product Code Top Mark - see ordering code.
Note: Orientation of Top Mark determines Pin One location. Read the Top Product Code Mark left to right, Pin One is the lower left pin (see diagram).

Pad Assignment for MicroPak



(Top Thru View)

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Absolute Maximum Ratings (Note 1)

Supply Voltage (V_{CC})	−0.5V to +7V
DC Input Voltage (V_{IN})	−0.5V to +7V
DC Output Voltage (V_{OUT})	−0.5V to +7V
DC Input Diode Current (I_{IK})	
@V_{IN} < −0.5V	−50 mA
@V_{IN} > 6V	+20 mA
DC Output Diode Current (I_{OK})	
@V_{OUT} < −0.5V	−50 mA
@V_{OUT} > 6V, V_{CC} = GND	+20 mA
DC Output Current (I_{OUT})	±50 mA
DC V_{CC}/GND Current (I_{CC}/I_{GND})	±50 mA
Storage Temperature (T_{STG})	−65°C to +150°C
Junction Temperature under Bias (T_J)	150°C
Junction Lead Temperature (T1);	
(Soldering, 10 seconds)	260°C
Power Dissipation (P_D) @ +85°C	250 mW

Recommended Operating Conditions (Note 2)

Supply Voltage Operating (V_{CC})	1.65V to 5.5V
Supply Voltage Data Retention (V_{CC})	1.5V to 5.5V
Input Voltage (V_{IN})	0V to 5.5V
Output Voltage (V_{OUT})	0V to V_{CC}
Operating Temperature (T_A)	−40°C to +85°C
Thermal Resistance (θ_{JA})	250°C/W

Note 1: Absolute maximum ratings are DC values beyond which the device may be damaged or have its useful life impaired. The datasheet specification should be met, without exception, to ensure that the system design is reliable over its power supply, temperature, and output/input loading variables. Fairchild does not recommend operation outside datasheet specifications.

Note 2: Unused inputs must be held HIGH or LOW. They may not float.

DC Electrical Characteristics

Symbol	Parameter	V_{CC} (V)	T_A = +25°C Min	Typ	Max	T_A = −40°C to +85°C Min	Max	Unit	Conditions	
V_P	Positive Threshold Voltage	1.65	0.7	1.1	1.5	0.7	1.5	V		
		2.3	1.0	1.4	1.8	1.0	1.8			
		3.0	1.3	1.75	2.2	1.3	2.2			
		4.5	1.9	2.45	3.1	1.9	3.1			
		5.5	2.2	2.9	3.6	2.2	3.6			
V_N	Negative Threshold Voltage	1.65	0.25	0.55	0.9	0.25	0.9	V		
		2.3	0.40	0.75	1.15	0.40	1.15			
		3.0	0.6	1.0	1.5	0.6	1.5			
		4.5	1.0	1.43	2.0	1.0	2.0			
		5.5	1.2	1.70	2.3	1.2	2.3			
V_H	Hysteresis Voltage	1.65	0.15	0.54	1.0	0.15	1.0	V		
		2.3	0.25	0.65	1.1	0.25	1.1			
		3.0	0.4	0.77	1.2	0.4	1.2			
		4.5	0.6	1.01	1.5	0.6	1.5			
		5.5	0.7	1.18	1.7	0.7	1.7			
V_{OH}	HIGH Level Output Voltage	1.65	1.55	1.65		1.55		V	$V_{IN} = V_{IL}$	$I_{OH} = -100\ \mu A$
		2.3	2.2	2.3		2.2				
		3.0	2.9	3.0		2.9				
		4.5	4.4	4.5		4.4				
		1.65	1.29	1.52		1.29				$I_{OH} = -4$ mA
		2.3	1.9	2.15		1.9				$I_{OH} = -8$ mA
		3.0	2.4	2.80		2.4				$I_{OH} = -16$ mA
		3.0	2.3	2.68		2.3				$I_{OH} = -24$ mA
		4.5	3.8	4.20		3.8				$I_{OH} = -32$ mA

DC Electrical Characteristics (Continued)

Symbol	Parameter	V_{CC} (V)	$T_A = +25°C$ Min	$T_A = +25°C$ Typ	$T_A = +25°C$ Max	$T_A = -40°C$ to $+85°C$ Min	$T_A = -40°C$ to $+85°C$ Max	Unit	Conditions	
V_{OL}	LOW Level Output Voltage	1.65		0.0	0.1		0.1	V	$V_{IN} = V_{IH}$	$I_{OL} = 100\ \mu A$
		2.3		0.0	0.1		0.1			
		3.0		0.0	0.1		0.1			
		4.5		0.0	0.1		0.1			
		1.65		0.08	0.24		0.24			$I_{OL} = 4$ mA
		2.3		0.10	0.3		0.3			$I_{OL} = 8$ mA
		3.0		0.15	0.4		0.4			$I_{OL} = 16$ mA
		3.0		0.22	0.55		0.55			$I_{OL} = 24$ mA
		4.5		0.22	0.55		0.55			$I_{OL} = 32$ mA
I_{IN}	Input Leakage Current	0 to 5.5			±0.1		±1.0	µA	$V_{IN} = 5.5V$, GND	
I_{OFF}	Power Off Leakage Current	0.0			1		10	µA	V_{IN} or $V_{OUT} = 5.5V$	
I_{CC}	Quiescent Supply Current	1.65 to 5.5			1		10	µA	$V_{IN} = 5.5V$, GND	

AC Electrical Characteristics

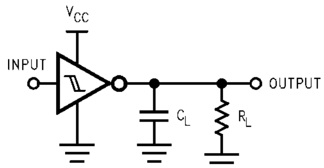
Symbol	Parameter	V_{CC} (V)	$T_A = +25°C$ Min	$T_A = +25°C$ Typ	$T_A = +25°C$ Max	$T_A = -40°C$ to $+85°C$ Min	$T_A = -40°C$ to $+85°C$ Max	Unit	Conditions	Figure Number
t_{PLH}, t_{PHL}	Propagation Delay	1.8 ± 0.15	2.0	7.6	12.5	2.0	13	ns	$C_L = 15$ pF, $R_L = 1\ M\Omega$	Figures 1, 3
		2.5 ± 0.2	1.0	5.0	9.0	1.0	9.5			
		3.3 ± 0.3	1.0	3.7	6.3	1.0	6.5			
		5.0 ± 0.5	0.5	3.1	5.2	0.5	5.5			
t_{PLH}, t_{PHL}	Propagation Delay	3.3 ± 0.3	1.5	4.4	7.2	1.5	7.5	ns	$C_L = 50$ pF, $R_L = 500\Omega$	Figures 1, 3
		5.0 ± 0.5	0.8	3.7	5.9	0.8	6.2			
C_{IN}	Input Capacitance	0		2.5				pF		
C_{PD}	Power Dissipation Capacitance	3.3		9				pF	(Note 3)	Figure 2
		5.0		11						

Note 3: C_{PD} is defined as the value of the internal equivalent capacitance which is derived from dynamic operating current consumption (I_{CCD}) at no output loading and operating at 50% duty cycle. (See Figure 2.) C_{PD} is related to I_{CCD} dynamic operating current by the expression:
$I_{CCD} = (C_{PD})\ (V_{CC})\ (f_{IN}) + (I_{CC}$ static).

Dynamic Switching Characteristics

Symbol	Parameter	Conditions	V_{CC} (V)	$T_A = 25°C$ Typical	Unit
V_{OLP}	Quiet Output Dynamic Peak V_{OL}	$C_L = 50pF$, $V_{IH} = 5.0V$, $V_{IL} = 0V$	5.0	0.8	V
V_{OLV}	Quiet Output Dynamic Valley V_{OL}	$C_L = 50pF$, $V_{IH} = 5.0V$, $V_{IL} = 0V$	5.0	–0.8	V

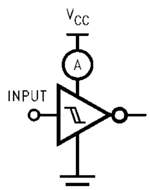
AC Loading and Waveforms



C_L includes load and stray capacitance

Input PRR = 1.0 MHz; t_w = 500 ns

FIGURE 1. AC Test Circuit



Input = AC Waveform; $t_r = t_f$ = 1.8 ns

PRR = 10 MHz; Duty Cycle = 50%

FIGURE 2. I_{CCD} Test Circuit

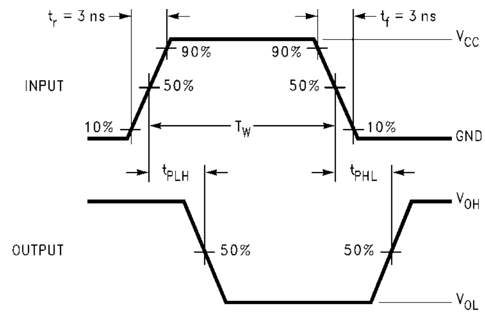


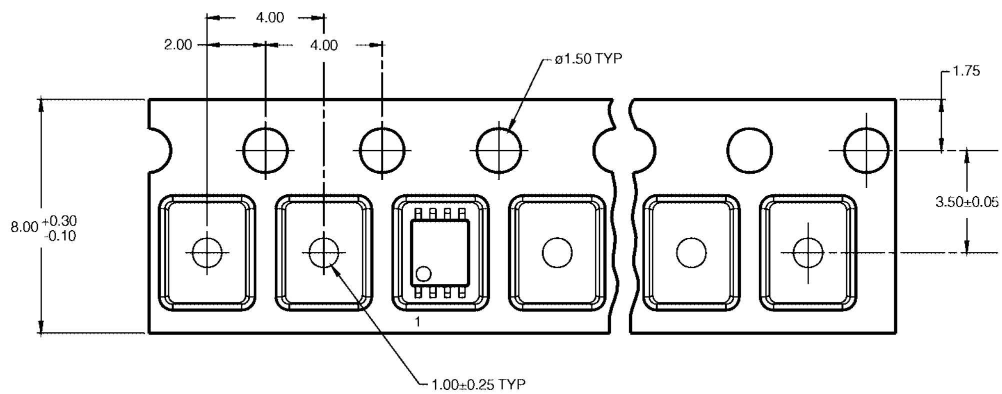
FIGURE 3. AC Waveforms

Tape and Reel Specification

TAPE FORMAT

Package Designator	Tape Section	Number Cavities	Cavity Status	Cover Tape Status
K8X	Leader (Start End)	125 (typ)	Empty	Sealed
	Carrier	3000	Filled	Sealed
	Trailer (Hub End)	75 (typ)	Empty	Sealed

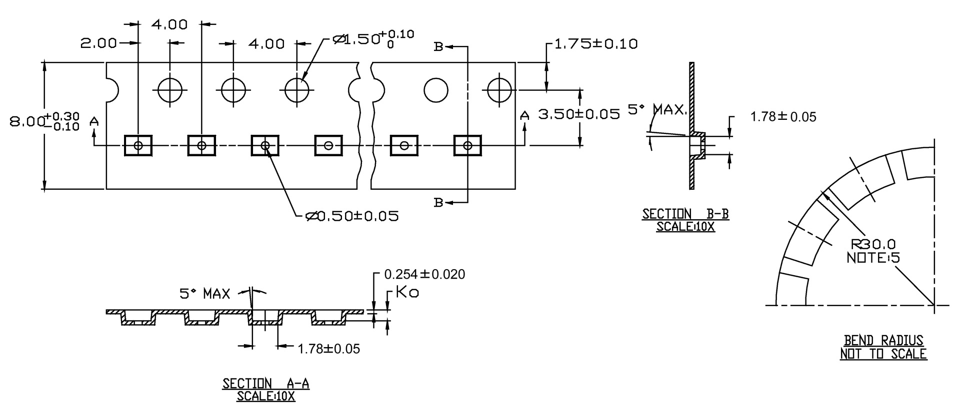
TAPE DIMENSIONS inches (millimeters)



TAPE FORMAT for MicroPak

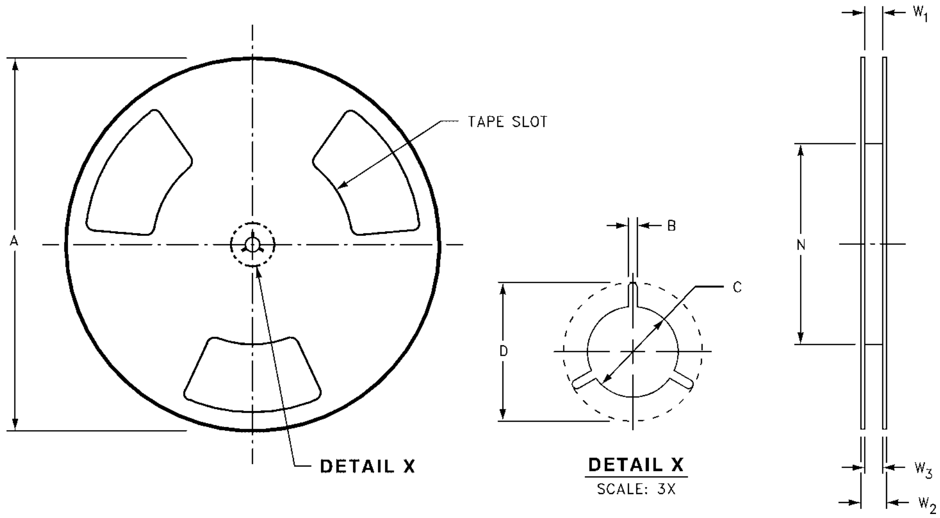
Package Designator	Tape Section	Number Cavities	Cavity Status	Cover Tape Status
L8X	Leader (Start End)	125 (typ)	Empty	Sealed
	Carrier	3000	Filled	Sealed
	Trailer (Hub End)	75 (typ)	Empty	Sealed

TAPE DIMENSIONS inches (millimeters)



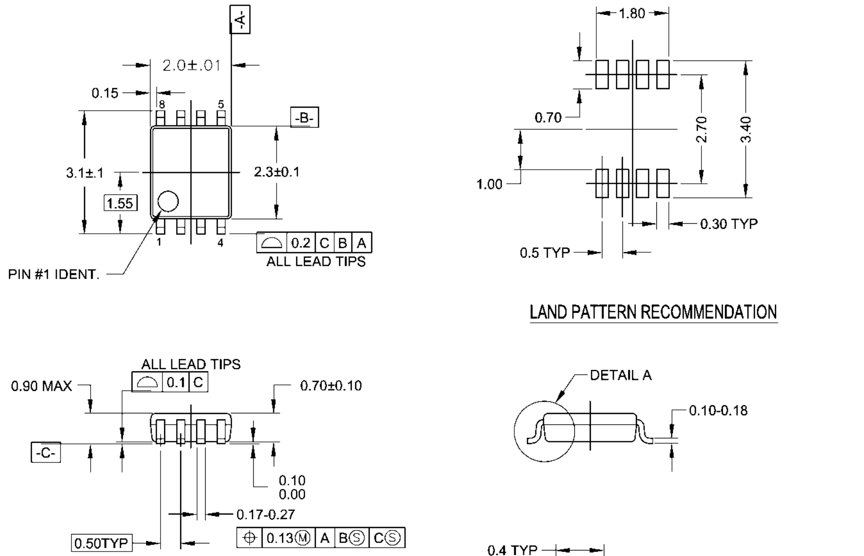
Tape and Reel Specification (Continued)

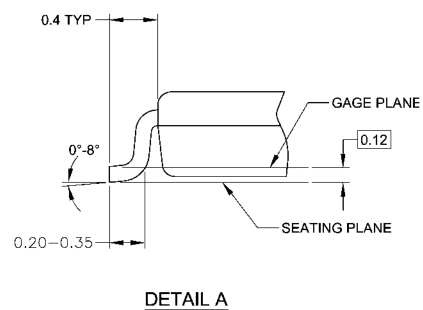
REEL DIMENSIONS inches (millimeters)



Tape Size	A	B	C	D	N	W1	W2	W3
8 mm	7.0 (177.8)	0.059 (1.50)	0.512 (13.00)	0.795 (20.20)	2.165 (55.00)	0.331 +0.059/–0.000 (8.40 + 1.50/–0.00)	0.567 (14.40)	W1 + 0.078/–0.039 (W1 + 2.00/–1.00)

Physical Dimensions inches (millimeters) unless otherwise noted





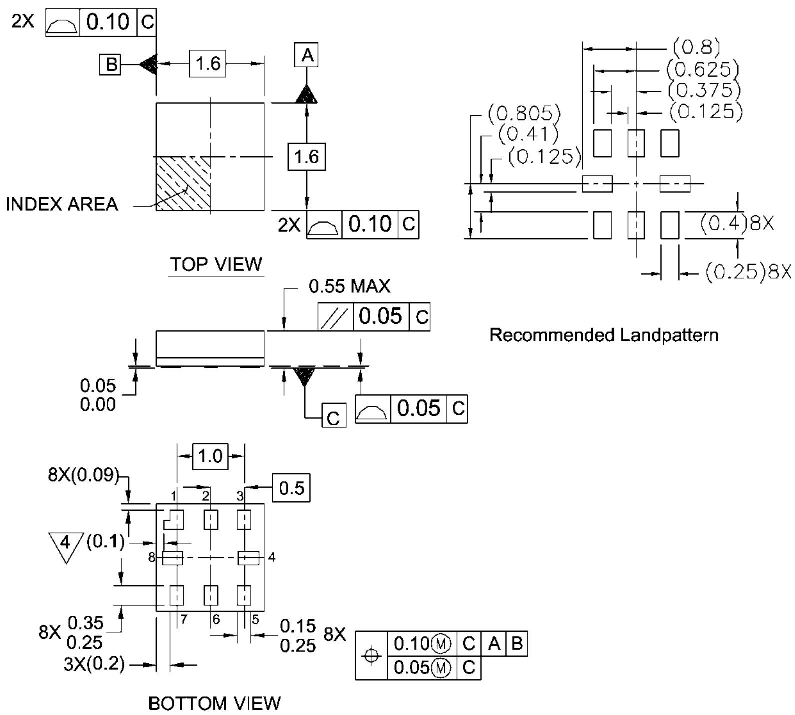
NOTES:

A. CONFORMS TO JEDEC REGISTRATION MO-187
B. DIMENSIONS ARE IN MILLIMETERS.
C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
D. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M, 1982.

MAB08AREVC

8-Lead US8, JEDEC MO-187, Variation CA 3.1mm Wide
Package Number MAB08A

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



Notes:
1. PACKAGE CONFORMS TO JEDEC MO-255 VARIATION UAAD
2. DIMENSIONS ARE IN MILLIMETERS
3. DRAWING CONFORMS TO ASME Y.14M-1994
4. PIN 1 FLAG, END OF PACKAGE OFFSET.

MAC08AREVC

Pb-Free 8-Lead MicroPak, 1.6 mm Wide
Package Number MAC08A